

In re Patent Application of:
HILL ET AL
Serial No. 10/761,409
Filed: January 22, 2004

IN THE CLAIMS

1. (currently amended) A doped semiconductor nanocrystal layer comprising

(a) a group IV oxide layer which is free of ion implantation damage,

(b) semiconductor nanocrystals distributed in the group IV oxide layer, and

(c) from 0.5 to 15 atomic percent of one or more rare earth elements,

wherein the one or more rare earth elements are (i) dispersed on the surface of the semiconductor nanocrystals and (ii) distributed substantially equally through the thickness of the group IV oxide layer.

2. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the group IV oxide layer comprises silicon dioxide or germanium dioxide.

3. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the group IV oxide layer has a thickness of from 1 to 2000 nm.

4. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the group IV oxide layer has a thickness of from 80 to 2000 nm.

5. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the group IV oxide layer has a thickness of from 100 to 250 nm.

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6. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the group IV oxide layer has a thickness of from 1 to 10 nm.

7. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the semiconductor nanocrystal is a group IV semiconductor, a group II-VI semiconductor or a group III-V semiconductor.

8. (original) A doped semiconductor nanocrystal layer according to claim 7, wherein the group IV semiconductor is selected from Si, Ge, Sn and Pb.

9. (original) A doped semiconductor nanocrystal layer according to claim 7, wherein the group II-VI semiconductor is selected from ZnO, ZnS, ZnSe, CaS, CaTe and CaSe.

10. (currently amended) A doped semiconductor nanocrystal layer according to claim 7, wherein the group III-V ~~III-V~~ semiconductor is selected from GaN, GaP and GaAs.

11. (previously presented) A doped semiconductor nanocrystal layer according to claim 1, wherein the concentration of semiconductor material in the group IV oxide layer is from 37 to 47 atomic percent.

12. (previously presented) A doped semiconductor nanocrystal layer according to claim 1, wherein the concentration of semiconductor material in the group IV oxide layer is from 40 to 45 atomic percent.

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13. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the semiconductor nanocrystals are from 1 to 10 nm in size.

14. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the semiconductor nanocrystals are from 1 to 3 nm in size.

15. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the semiconductor nanocrystals are from 1 to 2 nm in size.

16. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the rare earth element is selected from cerium, praseodymium, neodymium, promethium, gadolinium, erbium, thulium, ytterbium, samarium, dysprosium, terbium, europium, holmium, lutetium, and thorium.

17. (original) A doped semiconductor nanocrystal layer according to claim 16, wherein the rare earth element is selected from erbium, thulium and europium.

18. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the rare earth element is in the form of an oxide or a halogenide.

19. (original) A doped semiconductor nanocrystal layer according to claim 18, wherein the halogenide is a fluoride.

20. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the rare earth concentration is from 5 to 15 atomic percent.

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21. (original) A doped semiconductor nanocrystal layer according to claim 1, wherein the rare earth concentration is from 10 to 15 atomic percent.

22. (currently amended) A semiconductor structure comprising a substrate, on which substrate is deposited one or more doped semiconductor nanocrystal layers ~~according to claim 1~~ comprising

(a) a group IV oxide layer which is free of ion implantation damage,

(b) semiconductor nanocrystals distributed in the group IV oxide layer, and

(c) from 0.5 to 15 atomic percent of one or more rare earth elements,

wherein the one or more rare earth elements are (i) dispersed on the surface of the semiconductor nanocrystals and (ii) distributed substantially equally through the thickness of the group IV oxide layer.

23. (original) A semiconductor structure according to claim 22, wherein the substrate is selected from a silicon wafers or a poly silicon layer, either of which can be optionally n-doped or p-doped, and a layer of fused silica, zinc oxide, quartz or sapphire.

24. (currently amended) A semiconductor structure according to claim 22, wherein the semiconductor structure comprises a plurality of doped semiconductor nanocrystal layers with one or more dielectric layers between each doped semiconductor nanocrystal layer; and wherein a plurality of the semiconductor nanocrystal layers includes a different rare

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earth element to enable fluorescence at different colors.

25. (original) A semiconductor structure according to claim 24, wherein the dielectric layer comprise silicon oxide, silicon nitrite or silicon oxy nitrite.

26. (original) A semiconductor structure according to claim 24, wherein the dielectric layer has a thickness of 1 to 10 nm.

27. (original) A semiconductor structure according to claim 24, wherein the dielectric layer has a thickness of 1 to 3 nm.

28. (original) A semiconductor structure according to claim 24, wherein the dielectric layer has a thickness of about 1.5 nm.

29. (original) A semiconductor structure according to claim 22, wherein the semiconductor structure comprises a current injection layer.

30. (original) A semiconductor structure according to claim 29, wherein the current injection layer is an indium tin oxide layer.

31. (original) A semiconductor structure according to claim 22, wherein the semiconductor structure has a thickness of 2000 nm or less.

32. - 55. (cancelled)

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56. (original) A doped semiconductor nanocrystal layer comprising

(a) a group IV oxide layer which is free of ion implantation damage,

(b) a semiconductor nanocrystal distributed in the group IV oxide layer, and

(c) one or more rare earth element, the one or more rare earth element being dispersed on the surface of the semiconductor nanocrystal.